AMENDMENTS TO THE DRAWINGS

Replacement Figures 1-4 are submitted concurrently herewith under a separate cover letter.

REMARKS

In view of the above amendments and the following remarks, reconsideration of the objections and rejections and further examination are respectfully requested.

The specification and abstract have been reviewed and revised to improve their English grammar and U.S. form. The amendments to the specification and abstract have been incorporated into a substitute specification and abstract. Attached are two versions of the substitute specification, a marked-up version showing the revisions, as well as a clean version. No new matter has been added.

Replacement figures 1-4 are submitted herewith under a separate cover letter. These replacement figures address the Examiner's objections on page 2 of the Office Action.

Original claims 1-9 were objected to as containing informalities. In view of the objections, claims 1-3 and 9 have been cancelled without prejudice or disclaimer to the subject matter contained therein, and replaced by new claims 10-13 which have been drafted to address the above-mentioned informalities. Furthermore, original claims 4-8 have been amended to address the Examiner's objections. Thus, it is respectfully submitted that these objections are no longer applicable.

Claims 14-17 have been added to depend from claims 4, 6, 10 and 12, respectively. Claims 14-17 include additional limitations such that the feedback signal is continuously generated and the adjusted differential signal is continuously adjusted.

Claims 4-8 were indicated as allowable if amended or rewritten to overcome the above-mentioned informalities. The Applicant would like to thank the Examiner for this indication of allowable subject matter. Although claims 4-8 have been slightly amended to improve their U.S. form, thereby overcoming the Examiner's objections, it is submitted that these amendments do not affect the Examiner's reasons for allowance. Therefore, it is respectfully submitted that claims 4-8 are allowable.

Claim 3 was rejected under 35 U.S.C. § 102(e) as being anticipated by Apfel (U.S. 6,356,624 B1). Further, claims 1 and 2 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gross et al. (U.S. 2003/0026282 A1) in view of Maclean et al. (U.S. 2001/0013263 A1). Moreover, claim 9 was rejected under 35 U.S.C. § 103(a) as being anticipated over McHale et al. (U.S. 2001/0043568 A1). These rejections are

believed clearly inapplicable to new claims 10-12, which correspond to original claims 1-3, respectively, and claim 13, which corresponds to original claim 9, for the following reasons.

New Claims 10 and 11 are Patentable Over Gross in View of Maclean

New independent claim 10 recites a transmitter for adjusting a degree of balance of a differential signal and transmitting an adjusted differential signal, the transmitter including, in part: (1) a transmitting signal monitoring unit operable to monitor at least one of a voltage and a current of the adjusted differential signal and output a feedback signal based on the at least one of the voltage/current monitored; and (2) a transmitting signal control unit operable to (a) receive the differential signal, and (b) control the at least one of the voltage/current applied to a pair of transmission lines according to the differential signal and the feedback signal. Gross, Maclean or any combination thereof fail to disclose or suggest a transmitting signal control unit operable to transmit an adjusted differential signal according to a differential signal and a feedback signal generated by a transmitting signal monitoring unit, as recited in claim 10 of the present invention.

In contrast, Gross teaches a spliterless multi-carrier modem capable of monitoring the amplitude of a transmitted signal in order to respond to disruptions associated with "disturbance events" (see Abstract, and Fig. 6). Specifically, Gross teaches that a monitor 100 monitors the amplitude of a data signal on line 14 and, if an amplitude of greater value than a predefined threshold value is detected on line 14, the monitor 100 sets a flip-flop 102 to an "active" state, wherein the flip-flop 102 enables a counter 104 which accumulates until a predefined count is reached and if a predefined count is achieved an output is provided which causes a transceiver to initiate the process of *switching to an appropriate table* (see Fig. 7, and paragraph 0107). Gross teaches that in the event of a "disturbance event" wherein the counter reaches the specified count so as to switch to a secondary channel control table, the secondary channel control table changes the conditions of the transmitter so as to specify a *diminished bit rate*, specify a *higher bit error rate*, or specify a *diminished power level and a diminished bit rate*, and

upon termination of the "disturbance event" use of the primary table will resume (<u>see</u> paragraph 0101).

Based on the discussion above, Gross merely teaches the monitoring of an amplitude of a signal and eventually switching to a secondary data table if the "disturbance event" occurs a predetermined number of times, wherein the secondary data table is used to adjust a bit rate or a bit error rate until the "disturbance event" terminates (i.e., *signal from the monitor does not directly feedback to the transmission device for making an adjustment*). However, Gross does not teach or suggest a feedback signal for *controlling the at least one of the voltage/current applied* to the pair of transmission lines *so as to adjust the degree of balance* of the transmitted adjusted differential signal. Simply stated, controlling the adjustment a transmission of a signal according to a feedback signal, as recited in claim 11, is not the same as or an obvious variation of *counting* a number of "disturbance events" and *eventually adopting* a secondary data table to account for the "disturbance events."

In light of the deficiencies of Gross, the rejection relies on the Maclean reference for teaching elements of the original independent claim 1 (i.e., new claim 10) that were not taught by Gross. In particular, Maclean teaches a power switch for switching between high power and low power amplifiers according to a voltage amplitude level of a signal (<u>see</u> Abstract, and paragraph 0046). In particular, Maclean teaches that if a specific peak voltage threshold has been exceeded the device switches between a high power amplifier and a low power amplifier.

Based on the configuration above, Maclean merely teaches switching between amplifiers based on a measured voltage. However, Maclean does not disclose or suggest, as discussed above, the transmission of an adjusted signal by a *transmission device*, monitoring of the voltage/current of the adjusted signal, and generating a feedback signal based on the voltage/current of the adjusted signal, wherein the feedback signal is *directly* used by the transmitting device to control further adjustment of the transmission of the adjusted signal. Accordingly, although the Maclean reference teaches switching power amplifiers to supply power to a transmission line, it is clear that the Maclean reference fails to address the deficiencies of the Gross reference. As a result, the combination of Gross and Maclean fail to render claims 10 and 11 obvious.

Because of the above-mentioned distinctions, it is clear that the features of amended claims 10 and 11 are not taught or suggested by Gross and Maclean or any combination thereof, and as a result claims 10 and 11 are patentable over the references relied on in the rejection. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time of the invention would not have been motivated to modify the references in such a manner as to result in, or otherwise render obvious the present invention as recited in amended claims 10 and 11. Thus, claims 10 and 11 are clearly allowable over the references relied on in the rejection.

New Claim 12 is Patentable Over Apfel

New independent claim 12 recites a receiver for receiving, from a transmitter, an adjusted differential signal having an adjusted degree of balance, the receiver including, in part: (1) a receiving signal monitoring unit operable to (a) receive the adjusted differential signal from the transmitter on the pair of transmission lines, (b) monitor at least one of a voltage and a current of the adjusted differential signal, and (c) generate a feedback signal based on the at least one of the voltage and the current monitored; and (2) a receiving status output unit operable to output, to the transmitter, the feedback signal generated by the receiving signal monitoring unit *so as to allow for adjustment of the degree of balance of the at least one of the voltage and the current applied to the pair of transmission lines by the transmitter.* Apfel fails to disclose or suggest (1) a receiving signal monitoring unit for *receiving an adjusted differential signal* from a transmitter and (2) a receiving status output unit for *outputting a feedback signal*, to the transmitter, based on the received adjusted differential signal, wherein the feedback signal is *for adjustment of the degree of balance of the voltage/current applied to the pair of transmission lines by the transmitter*, as recited in independent claim 12.

In contrast, Apfel teaches a method and apparatus for detecting and measuring foreign interval digits. Specifically, Apfel teaches a voltage monitoring circuit 50 having an "A" line 40 and a "B" line 45 for receiving a foreign voltage (see Fig. 2, col. 2, lines 40-42). Moreover, the voltage monitoring circuit 50 includes output terminals 71 and 72 that are coupled to A/D converters 75 and 80, wherein the voltage applied to output terminals 71 and 72 is proportional to the voltage on A line 40 and B line 45 (see Figs. 2

and 3, and col. 2, lines 62-63, and col. 3, lines 50-54). Further, Apfel teaches that the A/D converters 75 and 80 may be located in a coder/decoder or a digital signal processor (DSP) to process the information output from output terminals 71 and 72 and/or change an operating mode of the voltage monitoring circuit 50 (col. 2, lines 62-67). Thus, the following differences between the present invention as recited in new claim 12 and the Apfel reference become evident.

Apfel teaches (1) the receipt of a foreign voltage by a monitoring circuit, (2) the measurement of the foreign voltage, and (3) the output of a voltage, proportional to the measured foreign voltage, to A/D converters located in a coder/decoder or a DSP to process the information provided and/or change an operating mode of the voltage monitoring circuit. However, Apfel does not disclose or suggest a receiving signal monitoring unit operable to *receive an adjusted differential signal from a transmitter*, monitor the voltage/current of the adjusted differential signal, and *output, to the transmitter, a feedback signal so as to allow for adjustment of the degree of balance of the voltage/current applied to the pair of transmission lines*. Specifically, Apfel does not teach the above-mentioned limitations of independent claim 12 because *outputting a proportional voltage that is not received by the source transmitting the foreign voltage to be measured by the monitoring circuit* is not the same as *outputting a feedback signal to the same source (i.e., the transmitter) from which the adjusted differential signal is received so that the differential signal can be further adjusted*, as recited by claim 12.

In view of the above, it is respectfully submitted that the Apfel reference does not anticipate the invention as recited in amended claim 12. Furthermore, Apfel does not suggest the above-discussed limitations of independent claim 12. Therefore, it would not have been obvious to one of ordinary skill in the art to modify the Apfel reference so as to obtain the invention of amended independent claim 12. Accordingly, it is respectfully submitted that amended independent claim 12 is clearly allowable over Apfel.

Amended Claim 13 is Patentable Over McHale

New claim 13 recites a transmitter for transmitting data using a pair of transmission lines, the transmitter including, in part: (1) a unit operable to apply to a first transmission line of the pair of transmission lines at least one of a voltage and a current

and apply to a second transmission line of said pair of transmission lines at least one of a voltage and a current, wherein (2) the voltage/current applied to the first transmission line is different from the voltage/current applied to the second transmission line *so as to allow for adjustment of a degree of balance of the voltage/current applied to the at least one transmission line and the second transmission line.*

In contrast, McHale teaches a communication server apparatus and method. Specifically, McHale teaches a communication server 58 having an input 62 a plurality of modems 160 which output data to a twisted pair of data lines 54 (see Fig. 4, Fig. 1, and paragraph 0054).

However, although McHale does in fact disclose a communication server having an input 62 and a twisted pair output 54, McHale does not disclose or suggest a transmitter for transmitting data using a pair of transmission lines wherein a voltage/current applied to a least one transmission line is different from a voltage/current applied to a second transmission line *so as to allow for adjustment of a degree of balance of the voltage/current applied to the first transmission line and the second transmission line*. Accordingly, McHale fails to disclose or suggest the features of independent claim 13. Thus, it is apparent that independent claim 13 is allowable over the McHale reference.

In view of the above amendments and remarks, it is submitted the present application is now is condition for allowance and an early notification thereof is earnestly requested. The Examiner is invited to contact the undersigned by telephone to resolve any remaining issues.

Respectfully submitted,

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Version with Markings to Show Changes Made

BALANCED TRANSMISSION APPARATUS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a balanced transmission system and an ~~art~~ apparatus related thereto that sends data using one pair or a plurality of pairs of conductors.

[0003] 2. Description of the Related Art

[0004] As an example, there is a power line communication system that sends data by superimposing a high frequency signal on a pair of metallic cables used for electric power transmission.

[0005] In such a case as sending data using one pair of metallic cables, EMC (Electromagnetic Compatibility) problems caused by the unbalance of a transmission line occur, as shown in Fig. 4.

[0006] These EMC problems include a leakage electric field induced by the metallic cables and extraneous noises coming into the metallic cables, both of which will deteriorate with increasing unbalance of the transmission line. These issues are described in detail in non-patent reference No.1 ("Problems and countermeasures for electromagnetic noises in telecommunication systems", Takeshi Ideguchi, et al., Morikita Shuppan, November 25, 1997, pp. 99 - 134).

[0007] In a balanced transmission system, complete balance is fundamentally required from a transmitting unit to a receiving unit. However, the complete balance is not realized due to the presence of unbalanced elements in transmitting and receiving circuit units or unbalance components on the transmission line.

[0008] Such unbalanced components in the transmission line may cause EMC problems, affecting other systems due to the leakage electric field or deteriorating performance of power line communication systems due to extraneous noises.

~~OBJECTS AND~~ SUMMARY OF THE INVENTION

[0009] In view of the above, an object of the present invention is to ~~provide an art of reducing~~reduce the effect of EMC problems caused by the unbalance of the power transmission line.

[0010] In a first ~~invention~~ aspect of the invention and a second aspect of the invention, either or both of electric voltage or electric current applied to each of a pair of conductors are monitored and the electric power or the electric current to be applied is controlled according to the monitored values.

[0011] This structure makes it possible to keep the balance at a transmitting point without depending on the degree of balance of the transmission line, thus reducing EMC problems in a transmitter.

[0012] In a third aspect of the invention, either or both of electric voltage or electric current outputt~~ed~~ from each of a pair of conductors at a receiver are monitored and their status will be outputt~~ed~~.

[0013] With this structure, the balance status in the receiver may be evaluated.

[0014] In ~~a~~ fourth and ~~a~~ fifth aspects of the present invention~~s~~, in addition to the third ~~invention~~ aspect described above, an output signal of a receiving condition output unit in the receiver is fed back to a transmitter, thereby either or both of electric voltage or electric current applied to each conductor will be controlled according to the fed-back output signal.

[0015] With this structure, the degree of balance in the receiving unit may be improved, thus serving to reduce EMC problems in the receiver.

[0016] From ~~a~~ sixth to ~~an~~ eighth aspects of the present invention, either or both of electric voltage or electric current applied to each of a pair of conductors is monitored in a transmitter, and either or both of electric voltage or electric current outputt~~ed~~ from each of a pair of conductors at a receiver are monitored and their status ~~will be~~ outputt~~ed~~. Then either or both of electric voltage or electric current to be applied to each of a pair

of conductors in the transmitter are controlled according to the monitored status.

[0017] With this structure, it may be possible to improve ~~the~~ a degree of balance in the receiver while keeping the balance in the transmitter, thus serving to reduce EMC problems both in the transmitter and the receiver.

[0018] The above, and other objects, features and advantages of the present invention will become apparent from the following description read in conjunction with the accompanying drawings, in which like reference numerals designate the same elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Fig. 1 is a block diagram illustrating a transmitter of a balanced transmission apparatus according to a first embodiment of the present invention.

[0020] Fig. 2 is a block diagram illustrating a transmitter and a receiver of a balanced transmission apparatus according to a second embodiment of the present invention.

[0021] Fig. 3 is a block diagram illustrating a transmitter and a receiver of a balanced transmission apparatus according to a third embodiment of the present invention.

[0022] Fig. 4 is a diagram illustrating effects of EMC problems in a prior art balanced transmission system.

DETAILED DESCRIPTION OF THE ~~PREFERRED EMBODIMENTS~~INVENTION

[0023] Preferred embodiments of the present invention will be described in conjunction with the accompanying drawings.

[0024] (Embodiment 1)

[0025] Fig. 1 is a block diagram illustrating a transmitter of a balanced transmission apparatus according to a first embodiment of the present invention.

[0026] As illustrated in Fig. 1, the transmitter according to the first embodiment of the present invention comprises a transmitting signal monitoring unit 11 and a transmitting signal control unit 12, wherein the balanced data to be sent is first input~~ted~~ into the transmitting signal control unit 12, and thereafter applied to a conductor 1 and a conductor 2 through the transmitting signal monitoring unit 11.

[0027] In this example, the degree of balance of the balanced data signal applied to the conductor 1 and the conductor 2 will be improved by using the apparatus in Fig. 1.

[0028] In Fig. 1, the balanced data input~~ted~~ into the transmitting signal control unit 12 is a differential signal that is converted from an unbalanced signal into a balanced signal by such an unbalance-balance converter as represented by an unbalance-balance converting transformer called a balun or a differential driver circuit, etc. Although this differential signal is assumed to be balanced perfectly, there is no problem in practice if the balance is not kept perfectly.

[0029] In the transmitting signal control unit 12, either a voltage value or a current value, or both values of the output will be changed ~~to output~~ so that the degree of balance for the ~~inputted~~ differential signal input may be improved.

[0030] The differential signal output~~ted~~ from this transmitting signal control unit 12 will be applied to ~~the~~ conductor 1 and ~~the~~ conductor 2 through the transmitting signal monitoring unit 11. At this time, the signal applied to the conductors may have a different value from the value output~~ted~~ from the transmitting signal control unit 12, according to the transmitting impedance of the transmitter and the transmitting line impedance (impedance of the conductors and of all the elements connected to the conductors). In this case, the degree of balance may deteriorate, although the transmitting signal control unit 12 has made adjustment in order to improve the degree of balance.

[0031] Thereby, either the voltage value or the current value, or both values actually applied to the conductors are monitored by the transmitting signal monitoring unit 11 and the signal level actually applied to the conductors are fed back to the transmitting signal control unit 12 (i.e., a broken line in Fig. 1). Using this feedback signal, the transmitting signal control unit 12 controls either the voltage or the current, or both so that the degree of balance of the signal actually applied to the conductors may be improved.

[0032] Consequently, the transmitting signal level to be actually applied to the conductors will be controlled according to the transmission line status. As a result, the degree of balance will ~~be improved~~improve.

[0033] In the above example, controlling the transmitting signal level with a regular feedback has been described. Determining the transmitting signal level with ~~one~~ an initial feedback ~~at first~~signal is also effective.

[0034] (Embodiment 2)

[0035] Fig. 2 is a block diagram illustrating a transmitter and a receiver of a balanced transmission apparatus according to a second embodiment of the present invention.

[0036] As illustrated in Fig. 2, the receiver according to the second embodiment of the present invention comprises a receiving signal monitoring unit 23 and a receiving status output unit 24. The transmitter includes a transmitting signal control unit 22, wherein balanced data to be sent is ~~first~~ initially inputted into a transmitting signal control unit 22, and thereafter applied to a conductor 1 and a conductor 2.

[0037] In this example, the degree of balance of a balanced data signal from the conductor 1 and ~~the~~ conductor 2 in a receiver will be improved by using the apparatus ~~in~~ of Fig. 2.

[0038] In the receiver, a ~~received~~ signal received from ~~the~~ conductor 1 and ~~the~~ conductor 2 connected to the receiver will be received through the receiving signal monitoring unit 23. The receiving signal monitoring unit 23 has a function to detect either the voltage value or the current value, or both values of the received signal, and to output the detected result to the receiving status output unit 24.

[0039] In the balanced transmission system according to the present embodiment, a signal sent through ~~the~~ conductor 1 and ~~the~~ conductor 2 as medium is a differential signal; therefore, the sum of the signal outputted from each conductor makes a fixed bias value. Fundamentally, this bias value is one applied in a transmitter, and can be specified. If the sum of the signal monitored in the receiving signal monitoring unit 23

is found to be different from the bias value applied in the transmitter, it means that a common mode signal is applied by some reasons. Generally, this is due to the unbalance of the transmission line. Accordingly, the receiver according to the present embodiment comprising the receiving signal monitoring unit 23 may evaluate the balance of the transmission line.

[0040] Furthermore, Fig. 2 also illustrates an example including a function to feedback the detected result by the receiving signal monitoring unit 23 into the transmitter through the receiving status output unit 24. At this time, the feedback signal is transferred to the transmitting signal control unit 22 in the transmitter, which makes it possible to control the transmitting signal according to the balance evaluated at the receiving signal monitoring unit 23. For example, if a value that is different from the bias value applied in the transmitter is detected in the receiving signal monitoring unit 23, the detected value is transferred to the transmitting signal control unit 22 in the transmitter. Then, the transmitting signal control unit 22 controls so as to decrease the difference between the bias value and the detection value detected by the receiving signal monitoring unit 23. As a result, the degree of balance in the receiver may be improved.

[0041] (Embodiment 3)

[0042] Fig. 3 is a block diagram illustrating a transmitter and a receiver of a balanced transmission apparatus according to a third embodiment of the present invention.

[0043] As shown in Fig. 3, in the balanced transmission apparatus in accordance with the third embodiment, balanced data is sent by the transmitter which comprises a transmitting signal monitoring unit 31 and a transmitting signal control unit 32, and is received by the receiver which comprises a receiving signal monitoring unit 33 and a receiving state output unit 34. The balanced data to be sent is first input~~ted~~ into the transmitting signal control unit 32, thereafter applied to a conductor 1 and a conductor 2 through the transmitting signal monitoring unit 31. The signal sent through ~~the~~

conductor 1 and ~~the~~ conductor 2 as medium is received by the receiving signal monitoring unit 33. The receiving signal monitoring unit 33 has a function to output either the voltage value or the current value, or both values of the received signal, which will be output~~ted~~ from the receiving ~~state~~ status output unit ~~34~~24.

[0044] In this example, the degree of balance of the balanced data signal applied to ~~the~~ conductor 1 and ~~the~~ conductor 2 will be improved by using the apparatus in Fig. 3.

[0045] In Fig. 3, balanced data to be sent is first input~~ted~~ into the transmitting signal control unit 32, thereafter applied to ~~the~~ conductor 1 and ~~the~~ conductor 2 through the transmitting signal monitoring unit 31. The operation of the transmitter according to the present embodiment is the same as in the first embodiment. The signal level to be actually applied to the conductors is monitored by the transmitting signal monitoring unit 31, and according to the signal level, the signal output ~~of~~ from the transmitting signal control unit 32 is controlled. This feature is effective to improve the degree of balance in the transmitter, as in the first embodiment.

[0046] Next, the operation of the receiver will be described. A signal transmitted through ~~the~~ conductor 1 and ~~the~~ conductor 2 as a medium is received through the receiving signal monitoring unit ~~33~~23. The receiving signal monitoring unit ~~33~~ 23~~has a~~ functions to output either the voltage value or the current value, or both values of the received signal, and the value will be output~~ted~~ from the receiving ~~state~~ status output unit ~~34~~24. The operation is the same as in the second embodiment, wherein the signal output is controlled by the transmitting signal control unit 32 of the transmitter so that a common mode signal level detected by the receiving signal monitoring unit ~~33~~ 23 may become small. This feature is effective to improve the degree of balance in the receiver as in the second embodiment.

[0047] The two kinds of operations mentioned above may improve the degree of balance both in the transmitter and the receiver.

[0048] The transmitting signal control unit 32 receives two feedback signals, the signal

from the transmitting signal monitoring unit 31 and the signal from the receiving ~~state~~ status output unit ~~34~~24. Therefore, the degree of balance of a transmitter is controlled to improve, for example, the degree of balance ~~of~~ the receiver may deteriorate. In this case, threshold values are provided with the signal from the transmitting signal monitoring unit 31 and the signal from the receiving ~~state~~ status output unit ~~34~~24. The threshold values may be ~~decided~~ determined by the allowance for the degree of balance of the transmitter or the degree of balance of the receiver. Each allowance for the degree of balance may be ~~decided~~ determined by the allowance for a leakage electric field level. For example, when controlling the transmitting output in the transmitting signal control unit 32 according to the signal of the transmitting signal monitoring unit 31, the sum of the signal levels applied to ~~the~~ conductor 1 and ~~the~~ conductor 2 is assumed to be the same as the bias value. This means that the degree of balance is high enough in the transmitter. However, in this case, the sum of the signal levels of ~~the~~ conductor 1 and ~~the~~ conductor 2 may be different from the bias value in the receiver. When different, whether the difference exceeds the threshold value or not will be checked. When ~~not exceeding~~the difference doe not exceed the threshold value, the leakage electric field of the whole system is judged to be small. When ~~exceeding~~ the difference does exceed the threshold value, the transmitted~~transmitting~~ output will be controlled by the transmitting signal control unit 32 in order to make the difference approach the threshold. As a result, although the degree of balance in the transmitter deteriorates, the degree of balance in the receiver improves. Thus, making both differences approach the corresponding threshold values improves the degree of balance of the whole system, which may result in reducing leakage electric fields.

[0049] In the above explanation, the configuration of the system is assumed to comprise one transmitter and one receiver. The same effect will be acquired for a system comprising a plurality of transmitters and receivers.

[0050] In conclusion, the present invention makes it possible to keep the balance at a

transmitting point without depending on the degree of balance of a transmission line, which results in reducing EMC problems in a transmitter.

[0051] The present invention also makes it possible to improve the degree of balance in a receiving point, while evaluating the balance in a receiver, which results in reducing EMC problems in the receiver.

[0052] Combining the two features mentioned above enables the degree of balance to be improved both in the transmitter and the receiver, which results in reducing EMC problems in the whole balanced transmission system.

[0053] Having described preferred embodiments of the invention with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention as defined in the appended claims.

ABSTRACT ~~OF THE DISCLOSURE~~

~~In a~~A transmitter~~,~~ functioning to monitor either ~~the~~ a voltage or ~~the~~ a current, or both applied to each of a pair of conductors ~~is monitored~~. ~~In a~~A receiver functioning to monitor either the voltage or the current, or both outpu~~tted~~t from each conductor ~~are monitored, thereafter the~~and functioning to output a status ~~will be outputted~~. ~~Using~~ According to the ~~outputted~~ status output, either the voltage or the current, or both applied to the conductors in ~~a~~ the transmitter will be controlled. This makes it possible to improve ~~the~~ a degree of balance in the receiver while keeping ~~the~~ balance in the transmitter, which results in reducing EMC problems both in the transmitter and the receiver.